Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claim 1 (canceled)

Claim 2 (Currently Amended): ~~The~~ A distributed feedback structure laser, ~~according to claim 1, further~~ comprising:

a lower quantum well structure extending along a resonator direction, said lower quantum well structure having a lamination of alternately stacked lower barrier layer and lower well layer having a band gap narrower than the lower barrier layer;

an intermediate layer disposed on said lower quantum well structure, said intermediate layer having a band gap broader than the lower well layer and a thickness thicker than the lower barrier layer;

an upper quantum well structure periodically disposed on said intermediate layer along the resonator direction, said upper quantum well structure having a lamination of alternately stacked upper well layer and upper barrier layer having a band gap broader than the upper well layer; and

a diffraction-grating-burying layer disposed on said intermediate layer along the resonator direction and covering said upper quantum well structure, said diffraction-grating-burying layer having a band gap broader than the lower and upper well layers,

wherein envelope of the upper quantum well structure is formed by etched profile which extends to and exposes said intermediate layer.

Claim 3 (Original): The distributed feedback semiconductor laser according to claim 2, wherein said intermediate layer has a surface step of a same repetition period and a same phase in repetition cycle as said upper quantum well structure.

Claim 4 (Original): The distributed feedback semiconductor laser according to claim 2, wherein said diffraction-grating-burying layer has a refractive index not higher than a refractive index of said intermediate layer.

Claim 5 (Original): The distributed feedback semiconductor laser according to claim 4, wherein said diffraction-grating-burying layer has a refractive index lower than a refractive index of said intermediate layer.

Claim 6 (Original): The distributed feedback semiconductor laser according to claim 4, wherein the refractive index of said intermediate layer is lower than a refractive index of the lower barrier layer.

Claim 7 (Original): The distributed feedback semiconductor laser according to claim 4, wherein the refractive index of said intermediate layer is substantially same as a refractive index of the lower barrier layer.

Claim 8 (Currently Amended): The distributed feedback semiconductor laser according to claim ~~4~~ 2, wherein the refractive index of said intermediate layer has an intermediate value between a refractive index of the upper and lower barriers layers and a refractive index of said diffraction-grating-burying layer.

Claim 9 (Currently Amended): The distributed feedback semiconductor laser according to claim ~~1~~ 2, wherein said intermediate layer has a thickness of not larger than 300 nm under said upper quantum well structure.

Claim 10 (Currently Amended): The distributed feedback semiconductor layer according to claim ~~4~~ 2, wherein said intermediate layer and said diffraction-grating-burying layer have a substantially same refractive index.

Claim 11 (Currently Amended): The distributed feedback semiconductor layer according to claim ~~1~~ 2, further comprising:

an InP substrate for supporting said lower quantum well structure,

wherein the lower and upper well layers are made of InGaAsP having a composition for a 1.5. μm band and the lower and upper barrier layers are made of InGaAsP having a composition for a shorter wavelength than 1.5 μm.

Claim 12 (Original): The distributed feedback semiconductor laser according to claim 11, wherein the lower and upper barrier layers are made of InGaAsP having a composition for a 1.2 μm band to 1.4 μm band.

Claim 13 (Original): The distributed feedback semiconductor laser according to claim 11, wherein said intermediate layer is made of InGaAsP having a composition for a 1.2 μm band to a 1.4 μm band.

Claim 14 (Original): The distributed feedback semiconductor laser according to claim 11, wherein said diffraction-grating-burying layer is made of InGaAsP or InP.

Claim 15 (Original): The distributed feedback semiconductor laser according to claim 8, wherein said diffraction-grating-burying layer is made of InGaAsP and the distributed feedback semiconductor laser further comprises an InP clad layer formed on said diffraction-grating-burying layer.

Claim 16 (Previously Presented): The distributed feedback semiconductor laser according to claim 11, wherein said upper quantum well structure, said intermediate layer and said lower quantum well structure are shaped in a stripe form and the distributed feedback semiconductor laser is a mesa or ridge type laser.

Claim 17 (Currently Amended): A method of manufacturing the distributed feedback semiconductor laser according to claim ~~1~~ 2, said method comprising the steps of:

(a) growing on a semiconductor substrate a lamination of alternately stacked lower barrier layer and lower well layer having a band gap narrower than the lower barrier layer, to form a lower quantum well structure;

(b) growing an intermediate layer on an uppermost lower well layer, the intermediate layer having a band gap broader than the lower well layer and a thickness thicker than the lower barrier layer;

(c) growing on the intermediate layer a lamination of alternately stacked upper well layer and upper barrier layer having a band gap broader than the upper well layer and a thickness thinner than the intermediate layer, to form an upper quantum well structure;

(d) forming a mask on the upper quantum well structure, the mask having periodical pattern;

(e) by using the mask as an etching mask, etching the upper quantum well structure in a periodical shape by using the intermediate layer as an etching margin layer; and

(f) removing the mask.

Claim 18 (Previously Presented): The method of manufacturing a distributed feedback semiconductor laser according to claim 17, further comprising a step of:

(g) growing a diffraction-grating-burying layer on the intermediate layer after said step (f), the diffraction-grating-burying layer covering the etched upper quantum well structure and having a band gap broader than the upper and lower well layers.

Claim 19 (Previously Presented): The method of manufacturing a distributed feedback semiconductor laser according to claim 18, further comprising a step of: (h) growing a clad layer on the diffraction-grating-burying layer after said step (g).

Claim 20 (Previously Presented): The method of manufacturing a distributed feedback semiconductor laser according to claim 18, further comprising the steps of:

(i) forming a stripe-shaped hard mask on the diffraction-grating-burying layer, the stripe-shaped hard mask extending along a direction traversing the periodical patterns;

(j) etching the diffraction-grating-burying layer, the upper quantum well structure, the intermediate layer and the lower quantum well structure, using the hard mask as an etching mask, to form a mesa structure;

(k) growing a mesa-burying-layer for burying side walls of the etched mesa structure; and

(l) removing the hard mask.

Claim 21 (Previously Presented): The method of manufacturing a distributed feedback semiconductor laser according to claim 17, wherein the mask having the periodical patterns is formed by performing two-beam interference exposure and development of a photoresist layer.

REMARKS

Claims 1 - 21 are pending in the present application. By this Amendment, claim 1 has been canceled and claims 2, 8, 9, 10, 11 and 17 have been amended to place the application in better condition for examination. Early examination and allowance of the application is respectfully requested.

More specifically, claim 2 has been amended into independent form and claims 8 - 11 and 17 have been amended to depend from claim 2.

Tsang discloses a periodic lower quantum well structure which is formed by etching utilizing the substrate as an etch stopper, an intermediate layer which should embed the etched profile and produce a planarized surface, and an upper quantum well structure formed on the planarized upper surface of the intermediate layer.

Applicant's claimed DFB laser comprises a lower quantum well structure, an intermediate layer formed on the lower quantum well structure, an upper periodic quantum well structure formed on the intermediate layer and patterned by etching utilizing the intermediate layer as an etch stopper, and a guide layer formed to cover the periodic upper quantum well structure.

The claimed structure is different from the Tsang device. Tsang does not teach to switch the upper and the lower quantum well structures. The Applicant's invention is easier to fabricate. It

would be difficult to stop etching precisely at an interface between the etched layer and an underlying layer serving as an etch stopper. Moreover, if the Examiner takes the position that it would have been obvious to switch the upper and the lower quantum well structures, then it is respectfully requested that the Examiner provide an explanation as to why such would be obvious.

Moreover, on page 3 of the Notice of Allowability dated May 20, 2003, the Examiner provided the following reasons for allowance:

> There is not taught or disclosed in the prior art a distributed feedback laser having upper and lower quantum well regions separated by an intermediate layer, where the upper quantum well region is formed periodically on the intermediate layer. There is further not disclosed a method of forming such a device. The prior art does disclose systems where upper and lower quantum well regions are separated by an intermediate layer, with the lower quantum well region being formed periodically (Tsang, previously cited US 5208824). However, Tsang does not teach or suggest that the upper quantum well layer may be the periodically formed layer. There is no motivation, other than from the present invention, for switching the formation so the upper quantum well layer is periodic. Further, this change would comprise a critical improvement, as the fabrication of the device of the present invention will be easier than that of the device of Tsang because the layers are more readily defined such that etching would be simpler.

It is respectfully submitted that claim 2, as amended, includes all the features relied upon by the Examiner in finding claim 1 allowable. As such, it is respectfully submitted that all of the pending claims 2 - 21 are allowable for at least the reasons discussed above.

If, for any reason, it is felt that this application is not now in condition for allowance, the Examiner is requested to contact Applicant's undersigned attorney at the telephone number indicated below to arrange for an interview to expedite the disposition of this case.

In the event that this paper is not timely filed, Applicant respectfully petitions for an appropriate extension of time. Please charge any fees for such an extension of time and any other fees which may be due with respect to this paper, to Deposit Account No. 01-2340.

Respectfully submitted,

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